

SENSORY ENVIRONMENT

RESEARCH AREAS



HUMAN FACTORS AND WATER CONSERVATION

This activity explores how building occupants and the human factors role are significant in water conservation efforts. Little information is available in the areas of occupant acceptance of water conservation measures. Occupant reaction, however, is often the key to the success or failure of a particular measure. A measure may be technologically and economically sound and yet be ineffective due to occupant resistance. A literature review is being undertaken in the areas of: 1) occupant acceptance of water conservation measures; 2) human factors relative to needs and usage; 3) incentives for conservation; 4) implementation strategies; and 5) techniques for, and effects of, consumer education.



CRITERIA FOR SIGNS IN WORKPLACES

Warnings and other safety-related information are frequently communicated through visual displays, both within fixed workplaces and around temporary work sites, indoors and outdoors. Many signing standards are based on tradition and lack scientific validation. Seeking to correct this situation, OSHA came to NBS for technical assistance. NBS responded with a plan for experimental research to improve criteria for new standards on signs in the workplace.

Three basic problems exist in the color and legend requirements for signs in the workplace today:

1. There is a growing proliferation of partly inconsistent requirements at the international, federal, and state levels addressing aspects of color/legend visibility.
2. In general, there is a lack of experimental research to support the criteria for these requirements. Previous work done in the area of safety colors only considered the appearance of those colors under daylight conditions. No provisions were made for the poorer color rendering of energy efficient lighting systems.
3. There are often no formalized procedures for measuring compliance with the requirements.

Federal agencies use over 12 different standards while private industry is confronted with 20 existing and 5 proposed color/legend standards. The adoption of a single, unified system would allow more rapid and more certain recognition of the meanings of visual displays. The criteria for signs-in-workplaces activity addresses these problems in order to bring OSHA's current standards on signs into agreement with the latest research findings and with national and international agreements which are moving towards a universal set of conventions for visual displays.



ILLUMINATION CRITERIA FOR BUILDINGS

This activity is developing a new basis for recommended levels of illumination that are applicable to most real world tasks and more energy conserving. The present recommendations state that increasing illumination levels increases visibility, whereas the new function recommends an optimum luminance level. Levels higher than the optimum, research indicates, can lead to decreased visibility, along with higher energy consumption.

How much light do we need to perform specific tasks? The visual performance data currently used to recommend levels of illumination are based on the simplest type of visual requirement, or threshold detection, in which a spot of light is barely visible. Researchers, designers, and engineers who don't subscribe to the newly recommended practices have argued that the experimental conditions under which the current recommendations are based are not simulations of real-world conditions.

The Sensory Environment Group has undertaken studies, therefore, to obtain a more valid determination of illumination requirements; that is, visual performance evaluated under stimulus conditions more nearly resembling situations encountered in everyday life, or "suprathreshold" levels (I see the target under both conditions, but it is more distinct under illumination condition A than B). Studies conducted at CBT under suprathreshold conditions indicate a significant difference between the functions. These findings suggest that "the more light the better sight" is an oversimplified explanation of illumination requirements and may be inaccurate under many circumstances. In short, too much light may impair performance.

Another part of this activity examines the effect of veiling reflectance on vision and energy consumption. Light sources are installed in luminaires that redirect the light from the lamp to the desired location. The design and placement of these luminaires affect energy consumption by the effectiveness of the light rays for visual task performance. An efficient luminaire will direct the lamp output to the desired location with the correct geometry, resulting in a minimum of veiling reflection.

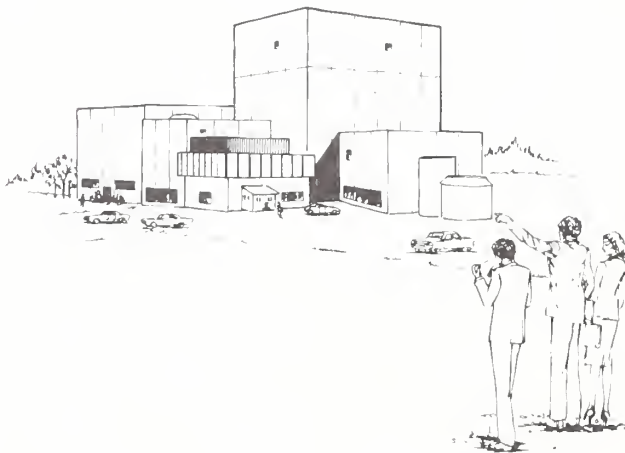


POST OCCUPANCY EVALUATION

Few buildings are evaluated once they are completed and occupied. The lack of such evaluations makes it difficult to determine in what ways buildings, from the standpoint of their intended use, fail or succeed. Moreover, if buildings designed in the future are to be more effective than those we have today, it is necessary to systematically determine what design features are successful (or unsuccessful) and why they perform as they do.

Post occupancy evaluations (POE) are being used more frequently to collect building user information. For the most part, POE investigations have been highly specific, examining the effectiveness of particular designs of buildings. Unfortunately, the many POE studies performed to date have been of limited use because of the questionable quality of the research in many instances. Standardized research controls are often absent, making it difficult or impossible to assess study findings or conclusions. Moreover, POE studies often deal with behavioral responses to environments which are inadequately described—thereby providing designers with little practical information, i.e., data which can influence future designs.

The work of the Sensory Environment Group is focused on the need to systematically upgrade the quality of POE data, ensure its relevance, and foster its timely application by the design profession. These goals are being accomplished by linking the collection of POE information to the design process. That is, design decisions which influence building user activities are being identified by examining selected designs and tracing (by interview, review of documents, etc.) the development of information which forms the basis for the decisions. At the same time, user data are collected, using traditional behavioral research approaches and innovative ones when required.



The long term objectives of these studies are to:

1. Develop and test a model linking the development of POE information to the design process. This systems' model will be based on general descriptions of design decisions which influence building usage.
2. Develop and field test standardized POE research methods. In this way, we can expect an orderly incremental development of relevant, reliable and valid POE information.
3. Seek national consensus on standard reference methods for voluntary use by building owners and users, programmers, designers, and evaluators in the public and private sectors.

Thus far, work has included:

- The compilation and evaluation of the state-of-the-art of research methods used in POE (and other building/people activities).
- The development and testing of a preliminary model describing some linkages between behavioral research and the design process.
- POE's of three buildings and system built housing—using traditional research procedures.